

Plaintiffs' Exhibit 21

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
Alexandria Division**

UNITED STATES, *et al.*,

Plaintiffs,

- against -

GOOGLE LLC,

Defendant.

**Civil Action No. 1:23-cv-00108
(LMB/JFA)**

DECLARATION OF NITISH KORULA

I, Nitish Korula, pursuant to 28 U.S.C. § 1746, hereby declare as follows:

1. I have worked for Google LLC (“Google”) for approximately thirteen years. From July 2016 through December 2021, I was a member of and led engineering teams developing Google products that allow publishers to sell display advertising inventory, including Google Ad Manager.¹ Since December 2021, I have been a Senior Technical Advisor to Prabhakar Raghavan at Google, based in the company’s office in New York City, and my current responsibilities include managing an engineering team on Google Assistant. Based on my personal experience with and knowledge of Google’s sell-side products, I describe below the material features of those products and my understanding of how they generally functioned up to the time that I transferred out of the sell-side engineering role in December 2021, though there may have been exceptions (e.g., bugs,

¹ Google Ad Manager combines functionalities that were previously called DoubleClick for Publishers (“DFP”) and AdX.

experiments, mediation chains²). The descriptions contained in this declaration do not cover or otherwise address product changes made after December 2021.

AdX Auction

2. Historically, Google's AdX ad exchange and most other ad exchanges operated second-price auctions. In a second-price auction, the buyer with the highest bid wins the auction, and pays the maximum of the applicable reserve price and the second-highest bid.³

3. Google—in its role operating AdX—receives a revenue share at the end of every auction, which is a percentage of the auction closing price paid by advertisers for ads appearing on the publisher's properties. Since 2017 (and up to at least December 2021), Google determined the highest bid in AdX auctions by comparing bids to each other on a "net basis"—that is, after deducting AdX's revenue share from the bids that buyers submitted to AdX. Before 2017, the implementation logic was more complex, but it had an equivalent effect: the highest bid net of take rate would win the AdX auction if it were above the applicable reserve price.

4. Up to at least December 2021, the ad associated with the highest bid would not serve unless that bid also exceeded the AdX reserve price. To determine whether the highest bid exceeded the AdX reserve price, Google would compare the highest bid net of AdX's revenue share to the AdX reserve price and would serve an AdX ad only where the highest bid—net of AdX's revenue share—exceeded the AdX reserve price.

² The vast majority of web inventory has not been sold with the use of mediation chains, and it has not been possible to configure mediation chains on Google Ad Manager for web inventory since April 2017.

³ In certain circumstances in which the highest and second-highest bids in AdX are sufficiently close to one another, their ranking may be randomly determined.

5. Before September 2019, when an ad associated with the highest bid in the AdX open auction was served, Google would generally charge the winning bidder the higher of (a) the second-highest bid in AdX; or (b) the reserve price.⁴

6. Before September 2019, along with a bid for each potential impression, AdX allowed each buyer to submit the minimum amount that the buyer (e.g., DSP) would pay if its bid won the AdX auction. The minimum payment value was not an actual second bid, but it functioned like a second bid because AdX used it to set the clearing price, much like a second bid could. AdX also permitted buyers to submit multiple bids as candidates in the auction (and continued to do so up to at least December 2021).

7. Many exchanges began to move from second-price to first-price auctions in the mid-to-late-2010s. In a first-price auction, the buyer with the highest bid wins the auction, and pays the amount they bid. In September 2019, Google completed the transition from a “second price” auction system to a unified “first-price” auction system (i.e. the Unified First Price Auction) for the Ad Manager auction. Google’s move to a Unified First Price Auction aligned with the broader industry, as most other auctions were already partially or completely first price.

8. Up until at least December 2021, it was possible for a publisher using Google Ad Manager to exclude AdX from the sale process altogether.

9. Up until at least December 2021, AdX offered advertisers a service called Cookie Matching that enabled bidders to match their cookies with Google cookies, so that bidders could identify the same browser in multiple contexts, increasing the efficiency of their advertising.

⁴ During the period when Dynamic Revenue Sharing v.2 was in effect, on a small minority of auctions, Google would charge the winning bidder more to offset discounts on the revenue share that were provided in previous auctions.

Dynamic Allocation

10. Dynamic Allocation was launched as a new feature in DFP in 2007. Dynamic Allocation enabled publishers to determine in real-time whether there were ad buyers willing to pay a price for a particular ad impression greater than what the publisher established or estimated its remnant demand partners would generate or than the fixed price negotiated with remnant demand partners. Using Dynamic Allocation, DFP established a “floor price” for AdX bids to beat, based on the highest price of any of the publisher’s eligible booked, static remnant line items (which a publisher could configure based on the estimated price of each remnant line item or a fixed price the publisher had negotiated with a particular remnant demand partner). AdX buyers would then submit real-time bids to try to beat this floor.

11. Up until at least December 2021, publishers could set the CPM for their booked static remnant line items (also referred to as “Value CPMs”).⁵ By configuring multiple line items with different targeting criteria, publishers could configure different Value CPMs based on, for example, time of day or the geography of the relevant user, even for the same demand partner. Some publishers set Value CPMs based on their estimates of what CPM a line item would likely generate (taking into account its historical performance) or based on a fixed price the publisher had negotiated with a particular remnant demand partner. Some publishers set Value CPMs higher than their estimates of what CPM a line item would likely generate to increase competitive pressure in the AdX auction or for other reasons. Under Dynamic Allocation, the Value CPM associated with the best eligible non-guaranteed line item could set the floor price in the AdX auction.

⁵ When configuring a remnant line item, a publisher must specify a rate (i.e., a price) for the line item. The publisher may also specify a “Value CPM”; this might be done when the price does not accurately reflect the value to the publisher of serving the line item. For example, if the publisher gave an advertiser a discount on a line item, the publisher could enter the discounted price as the rate and the undiscounted price as the Value CPM. If a publisher does not specify a Value CPM, then Google sets the Value CPM equal to the rate.

12. From the launch of Dynamic Allocation in around 2007 until Google introduced Enhanced Dynamic Allocation in 2014, line items determined to be “guaranteed” on a request were always served without considering AdX, AdSense, or any line items determined to be “non-guaranteed” on that request.⁶ Prior to 2014, the operation of Dynamic Allocation depended on how a publisher configured its line items in DFP. DFP used different default prioritization rankings (from 1 to 16) for different line item types. Guaranteed line items (which include “Sponsorship” and “Standard” line items) were typically priority 1-10. AdX line items were typically priority 12 and competed with other line items at priority 12-16. If AdX and other remnant line items were at priority 12, and there was an eligible guaranteed line item at priority 1-11, then AdX was not called via Dynamic Allocation, and the best eligible guaranteed line item served. If there was no eligible line item at priority 1-11, then AdX was called via Dynamic Allocation. If AdX returned a bid with an effective CPM higher than the best eligible remnant line item’s CPM, the AdX ad won. If AdX returned a bid with a lower effective CPM, the best eligible remnant line item won.

Header Bidding

13. Around 2014, web publishers began to adopt Header Bidding. Where Header Bidding is used by a publisher, the publisher includes code in its web pages that the browser “reads” to activate the process. When a user visits the publisher’s site, the browser calls participating ad exchanges or other demand partners (either directly or via a header bidding server) to submit bids, and runs an auction between those bids before Google’s ad server is called. These Header Bidding auctions are typically first-price auctions. After the conclusion of a Header

⁶ On a particular request, a “standard” or “sponsorship” line item was determined to be “guaranteed” if the publisher has configured it with a higher priority than AdX, AdSense, and any remnant line item eligible on that request.

Bidding auction, the publisher then typically passes information about the winning bid from the Header Bidding auction to Google's ad server in real-time.⁷

14. Up until at least December 2021, the winning bid from the Header Bidding auction was typically used to trigger a specific line item that the publisher had booked within Google's ad server (most commonly a remnant line item), and as described above in paragraph 11, the Value CPM of that line item could represent the winning Header Bidding bid as a floor in the AdX auction (prior to September 2019) or as a competing bid in the Unified First Price Auction (from September 2019 onwards).

Interaction Between Header Bidding and Dynamic Allocation

15. Beginning around 2014 and up to at least December 2021, publishers often used Header Bidding and Dynamic Allocation together to put AdX in competition with remnant line items.

16. Based on the Dynamic Allocation process described above in paragraphs 10-12, a Header Bidding line item could compete for publisher inventory against bids from AdX and other remnant line items.

17. The fact that AdX would be called after the header call has been characterized by some third parties as a "last look" for AdX. But "last look" was not designed to give AdX an advantage when competing against Header Bidding. It was simply the result of the Header Bidding auction taking place before the AdX auction ran and the way that publishers configured Header Bidding line items to work with Dynamic Allocation.

⁷ Header Bidding can also be configured to pass multiple bids to Google's publisher ad server.

Enhanced Dynamic Allocation

18. Before 2014, publishers with guaranteed delivery contracts faced the challenge of ensuring that they complied with contractual requirements to deliver impressions to specific advertisers without sacrificing revenue by allocating inventory to direct deals when indirect demand sources would pay more.

19. In March 2014, Enhanced Dynamic Allocation was introduced to allow remnant line items, AdX line items, and AdSense line items to compete simultaneously with the guaranteed line items with no impact to the delivery of guaranteed line items. The indirect demand source (e.g., AdX or a remnant line item) was eligible to win the impression if the revenue to be derived from that indirect demand source was higher than the opportunity cost of not serving the guaranteed line item.

20. Up to at least December 2021, with Enhanced Dynamic Allocation, the ad server calculated what is known as a temporary CPM for a guaranteed deal. The temporary CPM took into account how much room the publisher had left to meet the agreed volume commitment and reflected the opportunity cost of not allocating the ad space to the guaranteed deal on that basis. The more behind schedule a guaranteed line item was, the higher the temporary CPM. Therefore, a guaranteed line item that was behind schedule would win more often, making it likely to satisfy its goal. DFP used past line item delivery information along with campaign goals to determine how frequently to serve a current line item to achieve its delivery goal.

21. If the pacing of the guaranteed line item required the associated ad to deliver in every possible instance, the temporary CPM would become infinite. As the guaranteed line item came closer and closer to fulfilling its goal, the temporary CPM approached 0. When the guaranteed line item fulfilled its goal, it was no longer a candidate in the AdX auction.

22. Between the launch of Enhanced Dynamic Allocation in 2014 and the launch of the Unified First Price Auction in 2019,⁸ the floor price in AdX was the highest of: (i) the publisher-configured floor price; (ii) the Enhanced Dynamic Allocation price set dynamically based on a temporary CPM (the “EDA price”); (iii) the price of the remnant line item that was selected as a candidate for the impression; and (iv) the price determined by optimization.⁹ Assuming for simplicity that (i) and (iv) are 0, if the highest effective AdX bid could beat both the EDA price and the price of the remnant line item that was selected as a candidate for the impression, then the ad associated with that AdX bid would win. If not, the guaranteed or remnant line item would win.

Open Bidding

23. Open Bidding became generally available in April 2018 (as Exchange Bidding).¹⁰ Open Bidding is a feature of Ad Manager and Google’s server-side alternative to header bidding. It allows third party ad exchanges to compete with line items booked in Ad Manager (including header bidding line items) and with Authorized Buyers, DV360, and Google Ads in a real-time auction. This technology allows publishers to invite third-party ad exchanges to submit bids with real time prices using standard real time bidding calls.

24. Open Bidding avoids the latency issues that publishers sometimes experience when trying to create the effect manually through self-implemented solutions (e.g. header bidding), as well as the transparency and privacy issues associated with header bidding. Most header bidding has traditionally taken place client-side, meaning the page sends out requests to individual ad

⁸ As described in paragraph 26, there was a brief period before Open Bidding became generally available when an Open Bidding bid could set the floor price in AdX.

⁹ Google launched a feature to optimize a publisher’s floor prices in April 2015. Before April 2015, the price determined by optimization was not considered in setting the floor price in AdX.

¹⁰ In mid-2019, Exchange Bidding for Ad Manager inventory rebranded as Open Bidding. For simplicity, I refer to it as Open Bidding throughout the remainder of this declaration.

exchanges and other demand sources, processes the responses, and then runs an auction, all via Javascript code running on the page. This may introduce latency issues and slow page loads. Header bidding is also not transparent because, although the publisher “accepts” the impression at a certain price, the header bidder may not actually pay the sum indicated in its bid.

25. Since it became generally available in April 2018 and up to at least December 2021, Open Bidding operated as a first-price auction. During this period, prior to AdX’s migration to a Unified First Price Auction, Google Ad Manager essentially ran two auctions for a specific ad impression when Open Bidding was available. First, a second-price, real-time bidding auction was run in AdX with bids submitted by Google Ads, DV360, and Authorized Buyers. Second, a first-price auction compared the winning price from the second-price AdX auction with bids from Open Bidding buyers.

26. Open Bidding was initially launched in alpha in 2016. Following the initial alpha launch of Open Bidding, Google removed AdX’s “last look” over Open Bidding, by ensuring that the clearing price from the AdX auction was compared to the highest bid from an Open Bidding buyer. Google removed this in response to customer feedback, before Open Bidding became generally available in April 2018.

27. Up to at least December 2021, for publishers that utilized Open Bidding, when an auction was won by an Open Bidder, Google Ad Manager’s standard charges for web display ads were 5% for GAM360 customers and 10% for other GAM customers, and Google’s standard charges for app and instream video ads were 10%.¹¹

¹¹ Open Bidding buyers that directly paid publishers were charged differently.

Dynamic Revenue Sharing

28. In August 2015, Google launched Dynamic Revenue Sharing (“DRS”), a sell-side optimization feature on AdX. Initially, DRS allowed Google to forgo its full revenue share in some auctions, enabling more transactions to proceed.

29. Google’s contracts with publishers specify how they will share revenue when AdX wins an impression. Up to at least December 2021, Google’s standard rate was 20% of the clearing price in the AdX open auction. Prior to DRS, a publisher would receive the same, fixed revenue share on each impression that AdX won. With DRS, the AdX revenue share could change on a per-impression basis, as long as each publisher received at least their agreed-upon share of the revenue (usually 80%) in aggregate over the contractual billing period.

30. Google rolled out DRS in three successive versions—DRS v1, DRS v2, and truthful DRS (tDRS)—each of which replaced the former version and added distinct features.

31. DRS v1, launched in August 2015, adjusted Google’s share of AdX revenue downward so that the net bid (i.e., the bid submitted by the buyer minus the AdX revenue share) would be able to clear the AdX reserve price. In this initial version of DRS, the minimum revenue share applied was 0% and the maximum revenue share applied was 20%. AdX probabilistically “throttled” (i.e., disabled) the application of DRS on some queries to ensure that, on average, Google maintained a revenue share of at least 19% for each AdX buyer and for each publisher (assuming AdX’s standard revenue share of 20% for open auction).

32. DRS v1 only applied when no AdX bid (net of AdX’s revenue share) was above the reserve price. All versions of DRS applied in the same way whether the applicable AdX reserve price was set by a publisher-configured floor, the EDA price, or the price of a remnant line item. In most cases when DRS applied, the reserve price was set by the publisher-set floor price. In this

situation where the highest bid would not meet the publisher-set floor price if Google took its full revenue share (and the transaction would therefore not happen at all), DRS allowed Google to forgo its full revenue share, enabling the transaction to proceed and the publisher to be paid.

33. In the second version of DRS (launched in December 2016), Google could still lower AdX's revenue share, but could also increase its revenue share in a subsequent AdX auction, if the bids were significantly higher and well in excess of the floor price. In DRS v2, the minimum revenue share applied was 0% and the maximum revenue share applied was 40%, but the objective was to keep the average revenue share at 20% over queries. Prior to launching DRS v2, Google conducted experiments to confirm that DRS v2 would accomplish the intended goal of benefitting publishers and allowing impressions to be sold that otherwise would not have been sold. A condition of launching DRS v2 was that it accomplish these benefits as opposed to solely shifting transactions from remnant line items (including header bidding line items) to AdX.

34. Beginning with DRS v2, AdX publishers could opt out of using DRS.

35. While DRS v1 and DRS v2 adjusted AdX's revenue share after receiving buyers' bids, tDRS, which launched in July 2018, adjusted AdX's revenue share before sending bid requests to AdX buyers. If tDRS predicted that a buyer would bid above the AdX floor price for an impression (unless that floor price was determined by Google's Reserve Price Optimization program), then Google would take a 20% revenue share for that impression. On the other hand, Google took a 0% revenue share when tDRS predicted that the buyer's bid was likely to be below the floor price. If tDRS predicted that a buyer would bid above the AdX floor for an impression and that floor price was determined by Google's Reserve Price Optimization program, then Google would apply a 20% revenue share to determine the price floor for the AdX auction but take an additional revenue share to make up for reduced revenue on other impressions.

36. DRS was discontinued in September 2019, following the launch of the Unified First Price Auction.

Unified First Price Auction

37. Since September 2019, the auction mechanism used by Google Ad Manager (in its role as an ad exchange through AdX) has been a unified “first-price” auction (“Unified First Price Auction”). The Unified First Price Auction compares the bids that the publisher has obtained for its inventory via a range of different channels at the same time. This includes bids from Google Ads, DV360, third-party Authorized Buyers, Open Bidding, and non-guaranteed line items (including bids from third-party exchanges submitted via header bidding).

38. Following the transition to the Unified First Price Auction and up to at least December 2021, the floor price was no longer set by reference to remnant line items. Instead, the floor price was the highest of: (i) the publisher-configured floor price; (ii) the EDA price; and (iii) the price determined by optimization. If no bid in the Unified First Price Auction exceeded the reserve price, then a guaranteed line item or a house ad would be served (if available) or no ad would be served.

39. Up to at least December 2021, the ranking of bids in the Unified First Price Auction worked as follows: (a) After the bids were received, the candidates were filtered for eligibility based on settings specified by a publisher: for example, some bids could be filtered out due to buyer blocks or failure to meet the reserve price; (b) Once the list of eligible bids was determined, the Unified First Price Auction then ranked the bids based on net CPM. Google’s Unified First Price Auction used net, rather than gross, revenue as it ran the auction on behalf of publishers and therefore was focused on maximizing the revenue the publisher received, rather than revenues paid by the advertiser. To be clear, net CPM reflected adjustments that the Unified First Price Auction

may have made to the bid submitted in order to account for fees that Google charged and to optimize the auction and increase the revenue to the publisher; and (c) The CPM-based ranking could be overridden by publisher choice. A publisher might, for example, have had a preferred deal where the publisher had arranged for a buyer to have priority regardless of price. In the Unified First Price Auction, the buyer with the highest net bid won the auction, subject to this ranking criteria, and paid the amount it bid.

Unified Pricing Rules

40. Pricing rules are pricing criteria that the publisher defines. Before Google implemented Unified Pricing Rules in May 2019, publishers could set reserve prices in AdX for specific buyers (e.g., Google Ads, DV360, third-party DSPs and ad networks), and AdX would filter bids that did not exceed the reserve price applicable to the buyer. However, publishers were unable to use the Google Ad Manager user interface to set pricing floors for Open Bidding partners and other indirect sources of demand trafficked through non-guaranteed line items. Instead, publishers had to undertake the complex and time-consuming task of configuring pricing floors separately on each exchange and network where their inventory was available.

41. Before Google implemented Unified Pricing Rules, buyers bidding across different channels could face different floor prices for the same impression, leading to the possibility of self-competition and making bidding across platforms more complex.

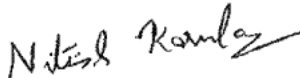
42. With the introduction of Unified Pricing Rules, publishers gained the ability to configure and manage pricing floors that apply to Google Ads, DV360, other Authorized Buyers, Open Bidding partners, and non-guaranteed line items, all from a single user interface in Google Ad Manager. The pricing rules were “unified” because Google Ad Manager did not support the possibility for the publisher to set different pricing rules for different buyers as part of a bid request,

i.e. the rules were applied equally across all buyers. Under Unified Pricing Rules, buyers' net bids faced the same reserve prices in the Unified First Price Auction across different buying channels.

43. Under the Unified Pricing Rules, publishers could not use Google Ad Manager to set different price floors for different buyers, but publishers were able to set different floors for specific advertisers, brands, ad sizes, categories and more (or otherwise set a floor for everything). In addition, publishers could continue to set different price floors for different ad exchanges using the tools made available by other ad exchanges, and these price floors would apply in addition to those from Unified Pricing Rules.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on August 4, 2023, in New York, NY.



Nitish Korula